X

WORKING PLAN

OF THE

RANIKHET CANTONMENT.

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DEPUTY CONSERVATOR OF FORESTS.

With additions suggested by

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CHAPTER I.—FACTS REGARDING ADMINISTRATION, SITUATION, AREA AND BOUNDARIES.

1. *Situation.*—The Cantonment of Ránikhet is situated on an inner ridge of the Himálayas about 28 miles north by west of the settlement of Naini Tál.

Area.—The total area of Cantonment is:—

	Acres.
Chaubattia and Ránikhet	4,081·440
Upat	133·760
Total ...	4,215·200

This area is subject to correction when the boundaries have been re-surveyed. Upat is used as a grazing area for Commissariat slaughter cattle and need not again be referred to.

2. *Boundary.*—The Cantonment of Ránikhet is bounded on the east by the Government Reserved Forest, north by the Padholi Government Protected Forest and village lands, west and south-west by the Chillianao, Ganiadeoli, and Chaubattia Government Protected Forests and village lands, south by the Chaubattia Government Protected Forests and village lands.

3. The boundary is in many places vague and should be properly demarcated by pillars.

I have been informed by the Executive Engineer, Military Works Branch, Ránikhet, that the work of demarcation is to be taken in hand during the ensuing cold weather.

4. *History of Cantonments.*—The Government Notification appropriating land for the Ránikhet Cantonment was issued in 1869, and the purchase of Mr. Troup's estate was effected in that year.

5. The Troup estate known as "Holm" was excluded from Cantonments for 20 years or during Mr. Troup's lifetime, the date of such exclusion being the 1st November, 1871.

6. *Area open to grazing.*—With the exception of 266 acres, the whole area of the Cantonment forests is open to grazing.

7. *Rights or privileges.*—No rights or privileges have been granted within the Cantonment area.

Under section 41 of Cantonment rules the Cantonment Committee can prohibit cutting grass on any public ground, and breaches of this rule, either by allowing grazing or by cutting grass, are punishable.

Protection.

8. *Present Establishment and distribution of the Cantonment into beats.*—The Forest establishment consists of one Forester who is assisted by four Forest Guards who patrol the entire area of Cantonment.

9. The establishment is sufficient, but the formation of definite beats is advisable, and the following distribution of the area is suggested :—

		Acres
Chaubattia beat—Compartments 1 to 6 (including 3*a* and 4*b*) also *a*, *e* and *f*, area	...	1,520 41
Jula Dobi beat—Compartments 7 to 10 and 12 and *b*	„ ...	912 11
Kumpur beat—Compartments 11, 13 to 15 and 19 and *c*	„ ...	1,239 63
Ránikhet beat—Compartments 16 to 18 and 20 and *d*	„ ...	409 29

10. Each Forest Guard should be held responsible to the Forester for the protection of all works within his beat; he should have quarters within its bounds, and he should not absent himself from his beat without sanction.

11. The Forester exercises general supervision over the entire area, and he should be responsible for planting, felling and other work, and keep up the necessary registers.

12. *Fire conservancy.*—The preservation of the Cantonment area from fire has been attempted since the formation of Cantonments.

Firing the forests within Cantonments has been prohibited, and any fires occurring have been extinguished as quickly as possible.

No record of success or failure of fire conservancy has been kept, but on the whole it appears to have been generally successful.

13. *Offences.*—No returns of offences against Cantonment rules affecting the conservation of the forests are available.

CHAPTER II.—CONDITION OF PRODUCTION.

TOPOGRAPHY, CLIMATE, SOIL AND SUB-SOIL.

14. *Topography.*—The hills in and near Cantonments consist of rounded or flat ridges with spurs and slopes of a similar character; there is very little precipitous ground.

15. *Climate.*—The highest point is 6,941 feet in Chaubattia, the lowest is about 5,000 feet in Ránikhet.

The mean elevation may be taken as 6,000 feet.

16. The average annual rainfall is 49·34 inches. The climate is mild, and is not marked by any great variation of heat and cold. The snowfall is light, and even on the highest points snow does not lie long on the ground.

17. *Soil and sub-soil.*—The rocks are chiefly micaceous schists, the soil is sandy and well drained, but at the same time is admirably suited to the growth of chír, while in moist ravines and hollows where vegetable mould has been produced, it is well adapted for the production of deodár and of oak and other broad-leaved trees.

18. *The stock.*—The standing crop consists of chír, banj, oak, rhododendron and miscellaneous trees.

The growth is distributed as follows :—

Compartments 12 to 18 and 20 consist of almost pure chír, with oak, rhododendron, &c., in the ravines. Compartments 5, 8, 10, 11 and 19 consist of chír, oak, rhododendron and miscellaneous trees in fairly equal quantities. Compartments 1 to 4, 6, 7 and 9 consist of oak, rhododendron and miscellaneous trees, with a few chír on the lower elevations on southern and western exposures.

19. The observations and experiments made by Messrs. Brereton and Fernandez to ascertain the rate of growth and contents of chír, oak and other trees, in connection with the preparation of a working plan for the Ránikhet forests have been described by Mr. Fernandez in his Ránikhet report, and the figures adopted for the forests surrounding the Cantonments apply equally to the growth in the latter area..

20. I extract the following from Mr. Fernandez's report :—

"It has been ascertained that at Ránikhet chír seedlings take on an average 15 years to establish themselves, that is to say, they make very little growth above ground until they are about 15 years old, when, if they receive sufficient light, they shoot rapidly ahead. Hence in computing the age of chír trees from ring countings on sections made a few feet off the ground, it is necessary to add 15 to the number of years given by the counting of the concentric rings; this has been done in the following estimate of ages for different girths. The thickness of the bark has been assumed to be 0·3 to 0 6 inch according to the size of the tree :—

"Girth breast high in inches ...	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108
Radius in inches,	1·0	1·9	2·9	3·8	4·8	5·7	6·7	7·6	8·6	9·6	10·5	11·5	12·4	13·4	14·3	15·3	16·2	17·2
Age in years ...	21	28	38	47	60	73	89	105	127	152	176	203	227	254	280	314	346	378

"Thus chír in the Ránikhet forests grows fairly rapidly up to three feet girth, or 70 years of age.

"Chír in these forests attains very nearly its maximun height on reaching a girth of about 4′ 6″, *i. e.*, at the age of about 130 years. The average height to which it can grow is only 100 feet.

"The very tallest tree is under 120 feet high.

"The average contents of chír trees—

4′ in girth	=	49	cubic feet.
5′ „	=	89	ditto.
6′ „	=	116	ditto.

"The average weight has been assumed at 46 lbs. per cubic foot.

"Weight of average :—

1st class tree	75	maunds of 100 lbs.
2nd ditto	45	ditto.
3rd ditto	20	ditto.
4th ditto	8	ditto.

"There are no data for ascertaining the rate of growth of oak trees. The average height attained by the oaks in these forests is about 55 feet, although under exceptionally favourable circumstances they may run up to 80 feet."

21. Mr. Fernandez, adopting Mr. Brereton's figures, gives yield :—

1st class oak	72	maunds of 100 lbs.
2nd ditto	21	ditto.
3rd ditto	9	ditto.
4th ditto	3	ditto.

The above at 60 lbs. per cubic foot—

1st	cubic feet	120
2nd	ditto	35
3rd	ditto	15
4th	ditto	5

Rhododendron and other species are assumed by Mr. Fernandez at 46 lbs. per cubic foot, and the yield contents for rhododendron is—

1st class, 30 maunds of 100 lbs.	cubic feet	65
2nd do., 14 ditto ditto	ditto	30
3rd do., 8 ditto ditto	ditto	17
4th do., 2 ditto ditto	ditto	4

22. *Standing Stock.*—The standing stock has been ascertained by an enumeration of all trees 18 inches and upwards in girth in the area it is proposed to treat as forest.

The ordinary classification has been adopted, *viz.* :—

1st class above 6 feet in girth					
2nd	ditto	4′ 6″ and up to 6 feet in girth..			
3rd	ditto	3′	ditto	4′ 6″	ditto.
4th	ditto	1′ 6″	ditto	3′	ditto.

A statement of the standing stock is given in Appendix B.

CHAPTER III.—ECONOMIC CONDITIONS.

23. *Description of Produce*—Chír for building timber.
Chír and other trees for fuel.
Fodder grass.
Grazing.
Chír needles for litter.

24. *Requirements to be met.*—These forests as regards requirements may be looked upon as subsidiary to the other adjacent Government forests.

Hitherto they have supplied the residents with fuel for firewood and charcoal, the residents and a portion of the Commissariat cattle with grazing and fodder grass.

25. *Chír Timber.*—The number of trees suitable for timber will be so small during the duration of this working plan, that it is sufficient to note that all trees suitable for timber should be sold as such and not as fuel.

No attempt will be made to separate timber from firewood.

26. The return of trees felled during the five years from 1881-82 to 1885-86, as given by Captain Anson, the Cantonment Magistrate, during that period is as follows :—

	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.
Oak trees for charcoal ...	334	480	288	329	181 }
Chír ditto ...	106	168	87	123	62 }
Oak trees for fuel; average per annum					=240

The 1885-86 figures are noted as untrustworthy, and are therefore excluded from the following calculations. The Sergeant in charge suffered from bad health and has since resigned.

Average annual consumption of charcoal, 4,000 maunds of 100 lbs., @ 6½ maunds of fuel per maund of charcoal = 26,000 maunds fuel.

27. The yield therefore seems to have been—

360 oak trees for charcoal, @ 63 maunds per tree ...	22,680 maunds.		
120 chír ditto, @ 30 ditto ...	3,600 „		
		26,280 maunds.	
240 oak trees for firewood, @ 63 ditto ...		... 15,120 „	
Total fuel			... 41,400 maunds.

28. *Grazing.*—The average head of cattle, for which grazing has been provided, is as follows :—

	Residents' cattle.	Commissariat cattle.	Total.
Horned cattle	120	125	245
Sheep and goats	84	259	343

These animals are allowed to graze on all available parts of Cantonments, except the reserved plot of grass land extending from Ganiadeoli to the Naini Tál road below the Ránikhet Station Hospital and round to the Kumpur cemetery, the area of which is 266 acres.

Mode of Working and Rates.

29. *Timber supply.*—No separate record of trees sold has been kept up, and receipts on this account have been included in the fuel receipts.

30. *Fuel and Charcoal.*—The right to fell trees for firewood and charcoal has been annually sold by auction, trees being marked for the cantractor as required, who converted them and maintained four depôts for the sale of firewood, whence it was removed by purchasers ; the charcoal is delivered at the consumers' houses.

Firewood sold at 5 maunds per rupee, and charcoal at the following rates :—

Oak	Re.	1	0	0	per maund.
Chír	„	0	12	0	ditto.

The average receipts have been—

	Rs
Firewood	1,880
Charcoal	2,050
Total ...	3,930

The profit on charcoal has been about 8 annas per maund, and on firewood about 4 annas per maund.

31. *Grazing and fodder grass.*—Monthly grazing passes for the open area have been issued at the following rates :—

	Per mensem.
Buffaloes	8 annas
Cows	4 „
Sheep and goats	2 „
	Rs.
Average per annum	1,276
Fodder grass sold by auction realized average per annum ...	217
Total .	1,493

32. Past revenue and expenditure :—

	Year.	Grazing fees	Sale of fodder grass.	Sale of wood for firewood and charcoal.	Total
		Rs	Rs	Rs.	Rs
Revenue	1881-82	1,776	250	3,938	5,964
	1882-83	1,307	275	3,553	5,135
	1883-84	1,247	175	3,358	4,780
	1884-85	1,023	210	4,578	5,811
	1885-86	1,027	175	4,218	5,420
Total	...	6,380	1,085	19,645	27,110
Average per annum		1,276	217	3,929	5,422

Expenditure.—The detail of each year cannot be given.

The annual charges are—

	Rs	Rs
Establishment—1 Forester, at Rs 20	240	
4 Forest Guards, at Rs 6	288	
		528
Contingencies		100
Two coolies, at Rs 5 and Rs 6 on plantations ...	132	
Planting charges	500	
		632
Total per annum ...		1,260

leaving a net annual profit of Rs. 4,162.

CHAPTER IV.—THE WORKING PLAN.

33. *Division of area.*—For the purposes of this report the Cantonment area is divided into two parts, *viz.* :—

I.—The area occupied by buildings, compounds, sites (including the Troup Estate), and small areas adjacent to the same ; these tracts are indicated on the map by a yellow wash and numbered *a*, *b*, *c*, *d*, *e* and *f*, area 1,103·69 acres.

II.—The Forest area which has been divided into 20 compartments, for a description of which see Appendix A.

34. *General proposals.*—The question of drawing up proposals for working the forest area of the Ránikhet Cantonments is complicated by the possiblity that additional land may in the future be required for sites for barracks, houses, bazárs, &c., with an attendant increase in the demand for grazing; and it is only possible at present to make proposals for 10 years, on the understanding that only grazing for the existing head of cattle is provided, and that any alteration affecting the area which is to be closed to grazing will involve a change in these proposals.

35. The head of cattle in Cantonment, as previously stated, is—

Horned cattle	245
Sheep and goats	343

Allowing three acres for each head of horned cattle and one acre for each sheep or goat, it is necessary to provide 1,078 acres of grazing land in Cantonments.

36. Taking into consideration grazing requirements in the vicinity of cattle sheds, &c., and allowing a margin for precipitous and poor land, it is proposed the following area should be open to grazing, namely, compartments 3 (excluding sub-compartment 3*a*), 6, 8, 11, 12, 13, 15, 16, 17, 18, 19 and 20 : total 1,433·76 acres.

37. It is proposed to close the following compartments to grazing :—

1, 2, sub-compartment 3*a* (deodár plantation), 4, including sub-compartment 4*b*, (the forest nursery and gum tree plantation), 5, 7, 9, 10 and 14 : total area 1,543·99 acres.

38. There is no reason to suppose this area is insufficient, but should any difficulty arise in closing the area noted in para. 37, it may be remarked that grazing is available in the open portions of the protected forests of the Ránikhet Forest Sub-Division.

39. *Forest operations in area I or the Station proper.*—It is proposed that in area I only such trees shall be felled as sanitary or ornamental considerations may demand ; such trees should be selected with the aid of a Forest Officer.

40. *Forest operations in area II, the Forest area.*—In the *open* forest area the grazing, though not excessive, precludes the expectation of regular reproduction, and fellings must be confined to the thinning out of trees on sanitary considerations, and the removal of suppressed trees which are not required for shade or for seed bearing, or which it is advisable to remove in the interests of more valuable trees.

41. Working this area progressively on these principles, there is every reason to suppose that, protected as it will be from fire, some slight improvement rather than deterioration in the growing stock may be expected.

42. In the *closed* forest area the condition of the growth is on the whole satisfactory, and as it is hoped complete protection from fire, grazing, lopping, &c., will be ensured, it is proposed to work it under a system of jardinage.

43. The stock in the closed forest area compares as follows with the stock in the Ránikhet Reserved Forest (areas 3*a* and 4*b* are not included in the area given, as they have not been valued):—

Species.	Cantonment closed forest, area 1,356 24 acres			Ránikhet Reserve, area 4,951 acres.				Cantonment closed forest.		Ránikhet Reserve			
	Girth class.	Number of trees.	Number of maunds.	Species.	Girth class.	Number of trees.	Number of maunds.	Number of trees per acre.	Number of maunds per acre.	Number of trees per acre.	Number of maunds per acre.		
Chír	1	234	21,300	Chír ...	1	2,066	154,950	0·209	15·708	0·417	31 296		
	2	2.027	91,215		2	22,408	1,008,360	1·495	67 268	4·526	209 668		
	3	6,977	139,540		3	32,000	640,000	5·145	102·905	6·463	129 267		
	4	32,274	258,192		4	42,000	336,000	23·801	190·407	8·483	67·865		
Total ...		41,562	510,247	...	...	98,474	2,139,310	30 650	376·288	19·889	432 096		
Oak ...	1	1,719	123,768	Oak ...	1	1,148	82,656	1 127	91·274	0·232	16·695		
	2	2,095	43,995		2	4,407	92,547	1 545	32·444	0·390	18 693		
	3	3,552	31,968		3	6,000	54,000	2 619	23·575	1 212	10 907		
	4	21,607	64,821		4	9,000	27,000	15 934	47 803	1·818	5·453		
Total ...	...	28,973	264,552	..	.	20,555	256,203	21 366	195·097	4·152	51·748		
Rhododendron ...	1	1,385	41,550		...	...	...	1·021	30 642	...	...		
	2	2,780	38,220		...	...	...	2 050	28·702	...	...		
	3	9,419	75,352		...	..	...	6·946	55 569	...	...		
	4	23,711	47,422		...	...	...	17 486	34 972	.	...		
Total ...	..	37,295	203,244		...	...	...	27 503	149 885	...	...	*Closed forest, Rhododendron and Miscellaneous together.*	
Miscellaneous ...	1	418	12,540	Other trees .	1	148	4,440	0·308	9 248	0·029	0·897	1 329	39 890
	2	853	11,942		2	3,040	42,560	0 629	8·807	0 614	8·596	2·679	37·509
	3	4,134	33,072		3	10,000	80,000	3 048	24·389	2·019	16 158	9 995	79·958
	4	27,675	55,350		4	17,000	34,000	20·409	40·818	3 434	6 867	37 895	75·790
Total ...	...	33,080	112,904	...	...	30,188	161,000	24·395	83·262	6·096	32 518	51 898	233 147
Total of Rhododendron and Miscellaneous.		70,375	316,148										
Total number of trees ...		140,910	1,090,947	...	...	149,217	2,556,513	103 916	804·533	30·138	516·363		

From this it will be seen that the proportion of 4th to 3rd, 3rd to 2nd, and 2nd to 1st is far more favourable in this portion of the Cantonment than in the reserve, while, as a rule, except in the vicinity of roads, &c., where cattle have grazed, the sites of charcoal kilns or tracts which have been damaged by forest fires, there is a very complete growth of seedlings.

44. Taking 40 years as the period during which a second class tree will become first class, it is believed the following number of trees may safely be cut out from 1887-88 to 1927-28:—

Stock to be removed from the closed forest during the 40 year period.

Species.	Girth class.	*Fellings during 40 years.* Percentage of growing stock.	Number of trees.	Number of maunds of fuel.	Annual outturn.
Chír	1	95	270	20,235	Trees of all descriptions, 1,115. Maunds (of 100lbs) of fuel, 11,637.
	2	50	1,013	45,607	
	3	25	1,744	34,885	
	4	30	9,682	77,457	
Total ...	...	...	12,709	178,184	
Oak	1	95	1,633	117,580	
	2	20	419	8,799	
	3	20	710	6,393	
	4	30	6,482	19,446	
Total ...	...	...	9,244	152,218	
Rhododendron ...	1	95	1,316	39,473	
	2	40	1,112	15,568	
	3	30	2,826	22,605	
	4	30	7,113	14,226	
Total ...	...	...	12,367	91,872	
Miscellaneous ...	1	95	397	11,913	
	2	40	341	4,776	
	3	30	1,240	9,921	
	4	30	8,302	16,605	
Total ...	...	...	10,280	43,215	
GRAND TOTAL ...	...	...	44,600	465,489	

45. With reference to the number of first class trees to be removed, it will be necessary to leave a certain number of trees in the vicinity of springs; for this 5 per cent has been allowed. As it is obviously advisable to err on the safe side, although the number of second and third class trees to be removed might be increased, the proportions proposed for the Ránikhet Reserve have been adopted.

46. It is proposed that this working plan shall be in force for a period of 10 years, *i.e.*, from 1887-88 to 1896-97, during which term is is believed the estimated yield of fuel is as follows: —

	Mds.
(1) Estimated annual yield from windfalls, dry trees, and thinnings in the station area 1,103·69 acres, at 50 lbs. per acre per annum	552
(2) Estimated annual yield from ditto ditto in the open forest, 1,433·76 acres, at 3 maunds per acre per annum (which is somewhat less than the outturn from these sources in the Naini Tál protected forests)	4,301
(3) Estimated annual yield of the closed forest as noted in para. 44	11,637
Total from all sources per annum ...	16,490

REGULATION OF CUTTINGS.

47. It is inexpedient to lay down hard and fast lines as to the exact course which fellings and thinnings should pursue, but the following suggestions for the guidance of the officer who will select the area to be thinned and the trees to be marked annually will be useful.

48. There are four depôts for the sale of fuel, *viz.*:—

(1) Above the Sadar Bazár.
(2) Near Kumpur Regimental Bazár.
(3) „ Ránikhet Mess-house.
(4) „ Chaubattia Regimental Bazár.

As the fuel available will have to be carried to the above depôts, it is convenient that the fellings in both open and closed forests should progress in several compartments at a time, and three groups of compartments are proposed:—

	Open forest.	*Closed forest.*
(1) Chaubattia compartments	3, 6	1, 2
(2) Kumpur ditto	8, 11, 15, 16, 17	7, 9, 14
(3) Ránikhet (Mess and Bazár) compartments ...	12, 13, 18, 19, 20	4, 5, 10

The fellings of first and second class trees should be made progressively through the compartments in these groups, beginning at one side and working steadily through the compartments. Thinnings of third and fourth class trees and saplings must be regulated by the state of each compartment, but should also be made regularly.

49. As a check is necessary on either under or over working, the operations in the open and closed forest (as stated in paras. 44 and 46) should be confined within the following areas during the periods noted:—

Period.	Compartment.	Marked in map.	Area in acres.	Total.	Compartment.	Marked in map.	Area in acres.	Total.	Total in closed and open.
	Closed forest.			*Chaubattia group.*			*Open forest.*		
1887-88 to 1889-90 .	2	*a.* 1	...	106	3	*c.* 1	62·25	...	...
„ ..	...	...	...	...	6	*c.* 1	42·24	104·49	210·49
1890-91 to 1892-93 ...	2	*c.* 2	38	...	6	*c.* 2	..	140·00	
„ ...	1	*c.* 2	47	85	...	...	...	..	225·00
1893-94 to 1896-97 .	1	*c.* 3	...	68·21	3	*c.* 3	...	103·10	171·31
		Total acres ...		259·21		Total acres ...		347·59	606·80
				Ránikhet (Mess and Bazár) group.					
1887-88 to 1889-90 .	10	*r.* 1	...	216·03	13	*r.* 1	86·94	...	.
...	...	...	...	...	18	*r.* 1	93·52	180·46	396·49
1890-91 to 1892-93...	4	*r.* 2	100	...	12	*r* 2	...	112·90	.
„ ...	5	*r.* 2	36	136·00	...	...	...	...	248·90
1893-94 to 1896-97...	5	*r.* 3	...	136·11	19	*r.* 3	110·77	...	.
„ ...	...	...	...	...	20	*r.* 3	123·93	234·70	370·81
		Total acres ...		488·14		Total acres .		528·06	1,016·20
				Kumpur group.					
1887-88 to 1889-90 ...	9	*k.* 1	...	161·36	11	*k.* 1	123·22	...	.
„ ..	...	...	...	...	16	*k.* 1	95·12	218·34	379·70
1890-91 to 1892-93 ...	7	*k.* 2	...	164·89	15	*k.* 2	105·26	...	...
„ ..	.	...	...	...	17	*k.* 2	84·45	189·71	354·60
1893-94 to 1896-97 ...	7	*k.* 3	49	...	8	*k.* 3		150·06	...
„ ..	9	*k.* 3	28	...	...		...	...	
„ ..	14	*k.* 3	123·93	200·93	..	...		..	350·99
		Total acres ...		527·18		Total acres ...		558·11	1,085·29
Total closed forest to be worked ...				1,274·53	Total Open forest .			1,433·76	
Closed forest areas not to be worked over during 10 years.									
3*a*.—Deodár plantation			83·74						
4*b*.—Forest garden			104·01						
4*c*.—(Area near rifle range not to be worked in 10 years).			81·71	269·36					
Total Closed Forest ...				1,543·99					

Abstract of areas to be worked during ten years :—

		Closed forest.		Open forest.		Total.
1887-88 to 1889 90	..	106·00	...	104·49		
		216·03	.	180 46		
		161·36	...	218 34		
		483·39	...	503·29	=	986·68
1890-91 to 1892-93	..	85 00	...	140 00		
		136 00	...	112 90		
		164 89	..	189 71		
		385 89	...	442 61	=	828 50
1893-94 to 1896-97	...	68 21	.	103 10		
		136 11		234 70		
		200 93	...	150 06		
		405 25	...	487 86	=	893·11
Total	...	1,274 53	...	1,433 76	=	2,708 29

Should any surplus stock (as shown in paras. 44 and 46) be available at the end of either of the three year periods, it should be distributed over the remainder of the 10 years for which this plan is drawn up. [The above addition to the proposals in this report was made on the suggestion of B Ribbentrop, Esq., Inspector-General of Forests.]

50. In all fellings and thinnings the object aimed at should be to encourage broad-leaved species and eliminate chir as much as possible from areas where broad-leaved trees and deodár will grow.

51. No attempt is made to sketch the condition of the forests 40 years hence, or even at the close of the 10 years' term assigned to the working plan. As already pointed out, the future of the Ránikhet Cantonment Forest area is very uncertain ; it may, and it is to be hoped it will, be possible to increase the closed area ; on the other hand, any increase in the station proper will probably necessitate a reduction of the closed area, and consequently a revision of these proposals. All, therefore, that can be attempted is so to regulate the fellings as to ensure the maximum safe contribution to the fuel demand for the Cantonment, and to prevent deterioration in the forest growth, and lastly to propose a methodical system of works of reproduction.

It is suggested that when the working plan for the Ránikhet Government forests is revised, the proposals sanctioned for the Cantonment forests should also be revised.

Works of Reproduction and Improvement.

52. *Fire conservancy.*—The assignment of definite beats to the forest guards and the issue of orders to be observed in the case of fires breaking out will render protection more methodical.

There is no necessity to introduce any system of fire lines, as the numerous roads, although in themselves sources of danger, serve as fire lines, and, in connection with the system of fire lines in the surrounding Government forests, are sufficient.

53. It would be advisable during the dry season to employ four assistant forest guards to assist in patrolling the forest and in preventing fires ; it would probably only be necessary to employ them during three months, so that this would only involve an expenditure of Rs 60 per annum.

54. A record of the results of fire protection illustrated by a map should be kept up ; a form for which is given in the appendix to this report.

55. *Planting operations.*—These operations have hitherto been carried on in a desultory manner ; some 70,000 seedlings of ash, gum, cypress, deodár, acacia, walnuts, &c., have been planted out during the last eight years, but it has been impossible to enter the areas planted up in the map, or to record in any satisfactory

way the failure or success of the operations. As a rule, it has been impossible, owing to the scattered nature of the work, to bestow sufficient care on the protection of the plants, and probably half the work done is a failure.

56. In future it is suggested that the planting work should be divided into two classes :—

(1) Ornamental planting in the station proper.

(2) Filling up blanks in the forest.

57. The first work will consist of roadside planting and putting down trees in plots at the junction of the roads, &c.

For this purpose the following trees are recommended :—

Deodár, cypress, chíl, spruce, horse-chestnut, walnut and ash ; all trees so planted out must be well fenced, and watered where necessary.

The allotment of Rs. 100 per annum for 10 years is proposed, and this sum should ensure the *successful* planting of some 2,000 trees.

58. The second—filling up blanks in the forest—should be taken up compartment by compartment, and work be confined to the closed forest.

The object aimed at will be to introduce broad-leaved trees wherever possible and where feasible to substitute deodár for chír.

It has been assumed, and it is believed with reason, that the change of species will improve the climate of Ránikhet, while the work hitherto done undoubtedly proves that both the soil and climate are favourable to foreign species.

59. It is proposed to commence work in compartments 5 near Chaubattia and 10 near Ránikhet.

The plants, save in the case of oak, the acorns of which will be planted, will be obtained from the forest nursery, and it is believed that an allotment of Rs. 200 per annum will be sufficient to successfully plant up 10 acres per annum.

60. The description of tree to be planted out must depend on local circumstances ; the further planting up with gums is not recommended, and the following list, it is believed, includes the most desirable trees :—

Banj and rianj oak, chestnut, walnut, ash, alder, Australian acacias, deodár, spruce and chíl.

Financial Results.

61. Prior to the issue of orders for the preparation of this working plan, it was decided that the heavy fellings of past years could not be continued, and it has been arranged that the demand for charcoal should be met from other forests with effect from the 1st April, 1887.

It is obvious that the income from Cantonment forests has been forestalled, and that if the proposals now made are sanctioned, a very considerable falling off in the net revenue must ensue.

62. The following is a forecast of the revenue and expenditure which may be expected :—

		Rs.
Revenue.—	Sale of grass	300
	Grazing	1,000
	16,000 mds. fuel, @ two annas per md. royalty	2,062
	Total Revenue ...	3,362
Expenditure.—	1 Forester, @ Rs. 20 per mensem...	240
	4 Forest guards, @ Rs. 6 per mensem each	288
	Fire conservancy	80
	Planting in station propor	100
	Ditto in forest area	200
	Contingencies, say	92
	Total Expenditure ...	1,000
	Net surplus	2,362

REGISTERS TO BE KEPT UP.

63. *Registers.*—Cash account.

Register of yield.
" plantations.
" fire conservancy.

Forms wil be found in Appendix D.

64. *Annual plan of operations.*—An annual plan of operations showing all work to be done should be drawn up in October of each year, for the ensuing year beginning from 1st April, and a report showing how far carried out be recorded annually in July for the previous year ending 31st March.

APPENDIX A.

Description of compartments.

No. 1.—*Boundaries*—*North*—The Government reserved forest.

East and South—Government protected forest of Chaubattia.
West—Compartment 2.

Area.—115·21 acres.

Configuration and aspect.—The direction of main ridge is north-west, and the slopes north-west and south-east, gradient nowhere very steep.

Elevation.—Maximum 6,000, minimum about 4 500.

Soil.—Varies with aspect and steepness of ground from a deep rich vegetable mould to a poor sandy soil on sunny slopes.

Stock.—Consists very largely of bánj, oak and rhododendron on the higher elevations with chír in sunny situations and miscellaneous growth in the ravines.

Reproduction —Seedlings fairly numerous ; bushes of oak and young chír occur everywhere ; the former seem to be kept back by being browsed over by cattle.

Artificial production.— Nearly all the trees are dead or dying.

Summary of valuation—See Appendix B.

No. 2—*Boundaries.*—*North*—The Government reserved forest.

East—Compartment 1.

South-West and West—Compartment 3.

Area.—144 acres.

Configuration and aspect.—Ground fairly easy, general aspect northerly.

Elevation.—Maximum 6,814, minimum 5,000.

Soil.—Good everywhere.

Stock.—Almost exclusively oak, rhododendron and miscellaneous species ; chír occurs in small numbers.

Reproduction.—Same as for Compartment 1.

Summary of valuation—See Appendix B.

No. 3—*Boundaries.*—*North*—Government reserve forest.

East—Compartment 2.
South—Chaubattia protected forest, Compartment 6, and excluded area C.
West—Excluded area C

Area.—165·35 acres, contains a deodár plantation, 3A.

3A —83 75 acres.

Configuration and aspect.—Cut up by numerous small ravines in which the ground is steep, elsewhere the ground is easy ; aspect of one-half northerly, the other easterly.

Elevation.—Maximum 6,856, minimum about 5,000.

Soil.—Rich deposit of vegetable mould generally covers the ground.

Stock.—Almost purely broad-leaved, chír being all but absent.

Reproduction.—Fully stocked with bushes and young trees.

Artificial reproduction.—Seedlings scarce. The deodár plantation is a complete success

Summary of valuation.—See Appendix B.

No. 4—Boundaries—North—By compartment 5.

East—Government reserved forest.

South—Excluded area C.

West—Compartments 7 and 5.

Area.—181·71 acres. Contains the Forest Department nursery and gum plantation 4B

4B.—104·01 acres.

Configuration and aspect.—A number of undulating ridges with a north-east aspect.

Elevation.—Maximum 6,813, minimum about 5,500.

Soil.—Fairly deep everywhere.

Stock.—A fairly equal admixture of chír and broad-leaved species, chiefly young trees ; the latter predominates.

Reproduction.—Excellent both as to seedlings, bushes and poles ; the southern or upper end of the compartment contains some old chír and a few old miscellaneous trees occur in the ravines ; with these exceptions the compartment may be looked upon as one already heavily felled over, but with a very fine crop of promising young trees.

Summary of valuation.—See Appendix B.

No. 5—Boundaries.—North—Government reserved forest and Mr. Troup's land.

East – Government reserved forest and Compartment 4.

West—Compartments 7 and 10 and Mr. Troup's land.

Area.—172·11 acres.

Configuration and aspect.—Same as No. 4.

Elevation —Maximum 6,236, minimum about 5,000.

Soil.—A trifle more sandy and dry than No. 4, but very good in the ravines.

Stock.—Chír, chiefly young growth, occupies all the exposed and sunny situations, preponderating over the broad leaved species, which are here confined to the ravines.

Reproduction.—Finer, if anything, than compartment 4.

Summary of valuation.—See Appendix B.

No. 6—Boundaries.—North—Excluded area C. and Compartment 3.

East—Chaubattia Government protected forest.

South— Ditto and village lands.

West— Ditto and the road leading to cemetery.

Area.—182·24 acres.

Configuration and aspect.—Well rounded ridges running southwards.

Elevation.—Maximum 6,940, minimum 6,500.

Soil.—A loose sandy soil, with a fair deposit of humus in moist situations.

Stock.—At the higher elevations the ground is occupied by a numerically fair growth of oak, scrubby from heavy loppings and browsing ; the western and lower part has some chír ; the miscellaneous species occur only in the ravines where the soil is best.

Reproduction.—Seedlings scarce, but there is a fair sprinkling of bushes, chiefly oak, which need protection from lopping and browsing; miscellaneous and chír poor.

Summary of valuation.—See Appendix B.

No. 7—Boundaries—North—Compartment 10.

East—Compartments 5 and 4, and excluded area C.

South—Excluded area C. and the cart-road.

West—Compartment 9.

Area.—213·89 acres.

Configuration and aspect.—Cut up by a number of streams running north-west; slopes north-east and south-west.

Elevation.—Maximum 6,500, minimum 6,170.

Soil.—Rich vegetable mould in most places; dry and poor at lower end of compartment.

Stock.—Chír at lower end; oak and miscellaneous elsewhere.

Reproduction.—Chír seedlings and poles in large numbers at lower end. Bushes of oak and miscellaneous fairly numerous in middle; few seedlings at upper end, the ground being densely covered with oak and miscellaneous trees.

Summary of valuation.—See Appendix B.

No. 8.—Boundaries—North—Compartments 9 and 7.

East—Excluded area C. and road to cemetery.

South-west—Chaubattia Government protected forest.

West—Compartment 12.

Area.—150·06 acres.

Configuration and aspect.—Three-fourths has a southern, some precipitous ledges of rock; the remainder, looking north, is fairly easy.

Elevation.—Maximum 6,550, minimum 6,000.

Soil.—Dry and sandy on southern exposure; clayey with rich deposit of humus on northern side.

Stock.—Chír on southern, oak and miscellaneous on ridges, northern aspect and in the ravines.

Reproduction.—Chír seedlings fairly numerous; poles deficient; bushes of oak and miscellaneous satisfactory; seedlings scarce.

Summary of valuation.—See Appendix B.

No. 9—Boundaries—East—Compartments 10 and 7.

South-west—Compartment 8 and excluded area *f*.

North-west—Compartment 11.

Area.—189·36 acres.

Configuration and aspect.—Rounded ridges, well marked streams; general aspect north-east.

Elevation.—Maximum 6,400, minimum 5,800.

Soil.—Rich and free.

Stock.—Good mixture of chír and broad-leaved species form on ridges; latter in ravines.

Reproduction.—Very good everywhere; oak bushes gradually establishing themselves amongst the chír.

Summary of valuation.—See Appendix B.

No. 10.—*Boundaries.*—*North-east*—Mr. Troup's land and Compartment 5.

South-east—Compartments 5 and 7.

West—Compartments 9 and 11 and 18.

Area.—216·03 acres.

Configuration and aspect.—Ridges running north-west, general aspect westerly; ground easy except near larger streams where it becomes precipitous.

Elevation.—Maximum 6,250, minimum 5,470.

Soil.—Poor and dry, suited for chír; better in the ravines.

Stock.—Chír trees scattered over the area; a good sprinkling of poles, broad-leaved species, chiefly young trees, on the better soil.

Reproduction.—Very good everywhere both as to chír poles and seedlings and bushes of broad-leaved species.

Summary of valuation.—See Appendix B.

No. 11.—*Boundaries.*—*East*—Compartment 10.

South-east—Compartment 9.

West—Excluded area *g* and Compartment 19.

Area.—123·22 acres.

Configuration and aspect.—A number of small ridges running east; gradient easy.

Elevation.—Maximum 6,200, minimum 5,500.

Soil.—Same as Compartment 9, except at lower end, where it is much drier.

Stock.—Chír at lower and mixture of chír and broad-leaved at upper end.

Reproduction.—Not good, heavily grazed over.

Summary of valuation.—See Appendix B.

No. 12.—*Boundaries.*—*North-east*—Excluded area *g*, Compartment 11.

Excluded area *f* and Compartment 9.

East and South-west—Chaubattia Government protected forest.

North-west—Compartment 13 and excluded area *g*.

Area.—112·90 acres.

Configuration and aspect.—Same as southern half of Compartment 8.

Elevation.—Maximum 6,350, minimum 5,500.

Soil.—Same as southern half of Compartment 8, dry and sandy.

Stock.—Chír predominates; broad-leaved in ravines.

Reproduction.—Chír very fair, both as to seedlings and poles; that of broad-leaved species not good.

Summary of valuation.—See Appendix B.

No. 13.—*Boundaries.*—*North-east*—Excluded area *g*.

South-east—Compartment 12.

South-west—Chaubattia Government protected forest.

North-west—Compartment 14.

Area.—86 94 acres.

Configuration and aspect.—Ridges running south-west; ground easy.

Elevation.—Maximum 6,200, minimum 5,500.

Soil.—Dry and free; admirably suited for chír.

Stock.—Chiefly chír, broad-leaved, occupies moist situations in ravines, &c.

Reproduction.—Same as compartment 12.

Summary of valuation.—See Appendix B.

No. 14.—*Boundaries.*—*North*—Compartment 15.

North-east—Excluded area *g*.

South-east—Compartment 13.

North-west—Village lands and Ganiadeoli Government protected forest.

Area.—123·93 acres.

Configuration and aspect.—A number of small ridges and ravines running south-west ; ground steep.

Elevation.—Maximum 6,200, minimum 5,500.

Soil.—Same as compartment 13.

Stock.—Purely chír with a slight admixture of oak in ravines.

Reproduction.—Chír poles plentiful at lower elevations ; chír seedlings and young trees near ridge.

Summary of valuation.—See Appendix B.

No. 15.—*Boundaries.*—*North-east*—Compartment 16 and excluded area *g*.

South and east—Excluded area *g*.

South—Compartment 14.

West—Village lands.

Area.—105·26 acres.

Configuration and aspect.—North-east, west and south-west are the principal aspects ; north-east the ground is very easy, west and south-west steep.

Elevation.—Maximum 6,230, minimum 5,700.

Soil.—On the north-east exposure loose but rich ; the rest is dry and admirably suited for chír.

Stock.—Almost pure chír, except on north-east, where a few oak and miscellaneous trees occur.

Reproduction.—Chír poles and young trees fairly numerous. Bushes of miscellaneous in north-eastern end.

Summary of valuation.—See Appendix B.

No. 16.—*Boundaries.*—*North-east*—Village land.

North-west—Compartment 17.

South-east—Compartment 15.

South-west—Chilliianao Government protected forest.

Area —95·12 acres.

Configuration and aspect.—Main aspect north-east ; ground easy except in ravines where it is precipitous.

Elevation.—Maximum 5,800, minimum 5,300.

Soil.—Poor and sandy, but well suited to chír.

Stock.—Pure chír.

Reproduction.—Chír poles plentiful.

Summary of valuation.—See Appendix B.

No. 17.—*Boundaries.*—*North-east*—Village land

South-east—Compartment 18.

South—Excluded area *g*.

South-west—Compartment 15.

North-west—Compartment 16 and village lands.

Area.—84 45 acres.

Configuration and aspect.—Main aspect northerly ; ground easy except near ravines.

Elevation.—Maximum 6,000, minimum 5,000.

Soil.—Poor and sandy, well suited to chír; artificially improved in places by deposit of night soil.

Stock.—Chiefly chír, miscellaneous and a few oak near village lands and water.

Reproduction.—Good, but not evenly distributed, the higher elevations being sparsely covered with young trees.

Summary of valuation.—See Appendix B.

No. 18.—*Boundaries.*—*North*—Village lands.

North-east—Padholi Government protected and reserved forests.

East—Mr. Troup's land.

South—Compartment 19.

West and south—Sadr Bazár.

North-west—Compartment 17.

Area.—93·52 acres.

Configuration and aspect.—Main part northerly; aspect in small portions looks south-west.

Elevation.—Maximum 5,800, minimum 5,300.

Soil.—Same as Compartment 17.

Stock.—Same as Compartment 17; broad-leaved species more numerous.

Reproduction.—Chír poles abundant; seedlings not so numerous as might be desired.

Summary of valuation.—See Appendix B.

No. 19.—*Boundaries.*—*North*—Compartment 18.

South-east—Compartment 11 and excluded area *g*.

South-west—Excluded area *g*.

North-west— Ditto.

Area.—110·77 acres.

Configuration and aspect.—Half south-east, half north; ground undulating.

Elevation.—Maximum 5,800, minimum 5,500.

Soil—Dry in most places, suited for chír; soil in ravines; good rich leaf mould.

Stock.—Chír and oak mixed, broad-leaved occupies the better soil to exclusion of chír.

Reproduction.—Not very good, heavily grazed over.

Summary of valuation—See Appendix B.

No. 20.—*Boundaries.*—*North.*—Padholi Government protected forest.

East—Government reserved forest.

South-east—Ditto ditto.

South—Doolikhet Government protected forest.

West—Almora cart-road.

Area.—123·93 acres.

Configuration and aspect.—General aspect northerly; ground easy.

Elevation.—Maximum 6,000, minimum 5,000.

Soil.—Dry and free in most places, on east and north-east it is a deep rich mould.

Stock.—Some Chír very large on the dry parts; appears to have been heavily felled over. Ravines and moist location crowded with miscellaneous growth of broad-leaved species.

Reproduction.—Seems to have been cut down and burnt for sanitary reasons, the standing crop being in the midst of the compartment.

Summary of valuation.—See Appendix B.

APPENDIX B.

Standing stock in Forest area.

(*a*) Standing stock in Forest open to grazing.

Number of compartments.	Area.	Class I.		Class II.		Class III.		Class IV.		Total	
		No. of trees.	No of maunds.	No. of trees.	No. of maunds.	No. of trees.	No. of maunds.	No. of trees.	No. of maunds.	No. of trees.	No. of maunds.
	Acres.				*Chir.*						
3	165·35	...	...	28	1,260	29	576	63	506	120	2,342
6	182·24	1	75	12	540	41	820	148	1,184	202	2,619
8	150·06	32	2,400	141	6,345	1,209	24,180	3,135	25,080	4,517	58,005
11	123·22	6	450	146	6,570	1,488	29,760	4,540	36,320	6,180	73,100
12	112 90	44	3,300	131	5,895	1,486	29,720	4,533	36,264	6,194	75,179
13	86·94	17	1,275	134	6,030	1,519	30,380	1,521	12,168	3,191	49,853
15	105·26	61	4,575	419	18,855	376	7,520	1,758	14,064	2,614	45,014
16	95·12	12	900	252	11,340	867	17,340	1,507	12,056	2,638	41,636
17	84·45	41	3,075	338	15,210	873	17,460	2,559	20,472	3,811	56,217
18	93·52	56	4,200	202	9,090	754	15,080	4,620	36,960	5,632	65,330
19	110·77	13	975	222	9,990	1,446	28,920	1,949	15,592	3,630	55,477
20	123·93	103	7,725	477	2,465	1,592	31,840	4,705	37,640	6,877	98,670
	1,433 76	386	28,950	2,502	112,590	11,680	233,596	31,038	248,306	45,606	623,442
					Oak.						
3	...	488	35,136	434	9,106	831	7,481	4,706	14,117	6,459	65,840
6	...	390	28,080	781	15,141	1,933	17,397	6,400	19,200	9,444	79,818
8	...	266	19,152	521	10,941	931	8,379	1,883	5,649	3,601	44,121
11	...	160	11,520	244	5,124	337	3,033	1,972	5,916	2,713	25,593
12	...	104	7,488	218	4,578	532	4,788	945	2,835	1,799	19,689
13	...	24	1,728	76	1,596	142	1,278	824	2,472	1,066	7,074
15	...	5	360	5	105	31	279	406	1,218	447	1,962
16	...	...	..	...	...	1	9	12	36	13	45
17	...	2	144	4	84	21	189	203	609	230	1,026
18	...	7	504	13	273	91	819	998	2,994	1,109	4,590
19	...	34	2,448	60	1,260	97	873	2,477	7,431	2,668	12,012
20	...	29	2,088	53	1,113	138	1,242	1,854	5,562	2,074	10,005
	...	1,509	108,648	2,349	49,321	5,085	45,767	22,680	68,089	31,623	271,775
					Rhododendron.						
3	...	250	7,512	409	5,728	1,066	8,531	2,370	4,741	4,095	26,507
6	...	156	4,680	209	2,926	751	6,008	1,578	3,156	2,694	16,770
8	...	76	2,280	209	2,926	566	4,528	1,264	2,528	2,115	12,262
11	...	31	930	65	910	350	2,800	1,059	2,118	1,505	6,758
12	...	10	300	34	476	63	504	119	238	226	1,518
13	...	...	...	4	56	8	64	30	60	42	180
15	...	...	...	...	...	5	40	17	34	22	74
16	...	...	...	...	...	...	...	...	..	...	...
17	...	...	...	...	...	...	...	1	2	1	2
18	...	...	...	...	...	1	8	7	14	8	22
19	...	1	30	...	...	3	24	94	188	98	242
20	...	1	30	4	56	24	192	118	236	147	514
	...	525	15,762	934	13,073	2,837	22,699	6,657	13,315	10,953	64,849
					Miscellaneous.						
3	...	63	1,896	134	1,882	798	6,381	4,302	8,605	5,297	18,764
6	...	2	60	17	238	133	1,064	1,328	2,656	1,480	4,018
8	...	7	210	20	280	111	888	1,118	2,236	1,256	3,614
11	...	8	240	21	294	112	896	1,491	2,982	1,632	4,412
12	...	6	180	16	224	50	400	290	580	362	1,384
13	...	...	...	14	196	37	296	248	496	299	988
15	...	...	...	...	...	15	120	153	306	168	426
16	...	...	..	...	..	...	...	62	124	62	124
17	..	...	...	3	42	15	120	117	234	135	396
18	...	...	...	2	28	39	312	458	916	499	1,256
19	...	1	30	...	...	25	200	1,148	2,296	1,174	2,526
20	...	...	...	8	112	64	512	671	1,342	743	1,966
	...	87	2,616	235	3,296	1,399	11,189	11,386	22,773	13,107	39,874
GRAND TOTAL ...		2,507	155,976	6,020	178,280	21,001	313,251	71,761	352,433	101,289	999,940

(*b*) Standing stock in closed forest :—

Number of compartments	Area.	Class I.		Class II.		Class III.		Class IV.		Total.	
		No. of trees.	No. of maunds.	No. of trees.	No. of maunds.	No. of trees.	No. of maunds.	No. of trees.	No. of maunds.	No. of trees.	No. of maunds.
	Acres.					*Chir.*					
1	115·21	96	7,200	470	21,150	1,355	27,100	6,581	52,648	8,502	108,098
2	144·00	10	750	101	4,545	247	4,940	587	4,696	945	14,931
3(A)	83·74	Deodár plantation			...	...	.	...	...	...	.
4	181·71	8	600	71	3,195	266	5,320	3,760	30,080	4,105	39,195
4(B)	104·01	Nursery and Gum plantation.				...	.	...	...	...	..
5	172·11	13	975	258	11,610	740	14,800	7,008	56,064	8,019	83,449
7	213·89	30	2,250	298	13,410	1,174	23,480	5,571	44,568	7,073	83,708
9	189·36	17	1,275	165	7,425	1,013	20,260	3,584	28,672	4,779	57,632
10	216·03	21	1,575	142	6,390	796	15,920	4,063	32,504	5,022	56,389
14	123·93	89	6,675	522	23,490	1,386	27,720	1,120	8,960	3,117	66,845
	1,356·24	284	21,300	2,027	91,215	6,977	139,540	32,274	258,192	41,562	510,247
	187·75	Deodár plantation, Nursery and Gum plantation stock not enumerated.									
						Oak.					
1	...	196	14,112	296	6,216	538	4,812	3,200	9,600	4,230	34,770
2	...	281	20,232	309	6,489	587	5,283	2,106	6,318	3,283	38,322
(A)	...	Deodár plantation			...	..		...	...	...	.
4	...	174	12,528	124	2,604	203	1,827	5,122	15,366	5,623	32,325
4(B)	...	Nursery and Gum plantation.					...	...	...	...	.
5	...	181	13,032	121	2,541	198	1,782	2,353	7,059	2,853	24,414
7	...	359	25,848	484	10,164	1,034	9,306	4,038	12,114	5,915	57,432
9	...	327	23,544	540	11,340	729	6,561	2,944	8,832	4,540	50,277
10	...	195	14,040	208	4,368	241	2,169	1,601	4,803	2,245	25,380
14	...	6	432	13	273	22	198	243	729	284	1,632
	...	1,719	123,768	2,095	43,995	3,552	31,968	21,607	64,821	28,973	264,552
						Rhododendron.					
1	...	197	5,910	525	7,350	1,712	13,696	5,976	11,952	8,410	38,908
2	..	234	7,020	406	5,684	1,472	11,776	3,668	7,336	5,780	31,816
3(A)	...	Deodár plantation			.	...	...	...	.	...	.
4	...	131	3,930	192	2,688	538	4,304	1,193	2,386	2,054	13,308
4(B)	...	Nursery and Gum plantation.				...	...	...	...	...	.
5	...	65	1,950	213	2,982	606	4,848	1,436	2,872	2,320	12,652
7	...	392	11,760	665	9,310	2,295	18,360	5,096	10,192	8,448	49,622
9	...	328	9,840	628	8,792	2,105	16,840	4,570	9,140	7,631	44,612
10	...	38	1,140	151	2,114	691	5,528	1,770	3,540	2,650	12,322
14	...	...	..	...	...	...	...	2	4	2	4
	...	1,385	41,550	2,780	38,920	9,419	75,352	23,711	47,422	37,295	203,244
						Miscellaneous.					
1	...	62	1,860	156	2,184	610	4,880	4,626	9,252	5,454	18,176
2	...	114	3,420	148	2,072	823	6,584	3,361	6,722	4,446	18,798
3(A)	...	Deodár plantation.			...	...		.		...	...
4	...	80	2,400	163	2,282	663	5,304	3,761	7,522	4,667	17,508
4(B)	...	Nursery and Gum plantation.				...	...	...	...		...
5	...	50	1,500	95	1,330	375	3,000	3,308	6,616	3,828	12,446
7	...	70	2,100	202	2,828	1,066	8,528	6,836	13,672	8,174	27,128
9	...	33	990	66	924	435	3,480	3,146	6,292	3,680	11,686
10	...	9	270	22	308	157	1,256	2,582	5,164	2,770	6,998
14	...	...	...	1	14	5	40	55	110	61	164
	...	418	12,540	853	11,942	4,134	33,072	27,675	55,350	33,080	112,904
GRAND TOTAL ...		3,806	199,158	7,755	186,072	24,082	279,932	105,267	425,785	140,910	1,090,947

(c).—Abstract of Standing Stock.

Area open to grazing, 1,433·76 *acres.*

Class	No. of trees	No. of maunds	Remarks
	Chir.		
I ...	386	28,950	
II ...	2,502	112,590	
III .	11,680	233,596	
IV	31,038	248,306	
Total	45,606	623,442	
	Oak.		
I ..	1,509	108,648	
II .	2,349	49,321	
III ...	5,085	45,767	
IV	22,680	68,039	
Total ...	31,623	271,775	
	Rhododendron		
I. ..	525	15,762	
II	934	13,073	
III	2,837	22,699	
IV ...	6,657	13,315	
Total	10,953	64,849	
	Miscellaneous		
I ...	87	2,616	
II	235	3,296	
III	1,399	11,189	
IV ...	11,386	22,773	
Total ..	13,107	39,874	
	Closed Forest area, 1356·24 *acres.*		
	Deodár plantation, Nursery and Gum plantation, 187 75 acres not valued.		
	Chir.		
I ...	284	21,300	
II. .	2,027	91,215	
III ...	6,977	139,540	
IV .	32,274	258,192	
Total ...	41,562	510,247	
	Oak		
I .	1,719	123,768	
II .	2,095	43,995	
III. .	3,552	81,968	
IV .	21,607	64,821	
Total ..	28,973	264,552	
	Rhododendron		
I ...	1,385	41,550	
II	2,780	38,920	
III. ..	9,419	75,352	
IV. ...	23,711	47,422	
Total ..	37,295	203,244	
	Miscellaneous		
I. ...	418	12,540	
II. ...	853	11,942	
III. .	4,134	33,072	
IV. ...	27,675	55,350	
Total ...	33,080	112,904	

APPENDIX C.

MEMORANDUM *re* FUEL SUPPLY.

Probable cost of 16,500 *maunds of fuel.*

Cutting and carrying an average distance of 1½ miles to depôt—

					Rs.
16,500 maunds, @ 1½ annas	...	...	...	...	1,547
Pay of 2 Munshis for 8 months, @ Rs. 6 each		...	...	...	96
„ 2 „ 12 „ @ Rs. 6 „		...	...	...	144
Cost of huts, weighing machines, &c.		...	...	...	60
			Total	...	1,847
Contractor's profit, say	...	...	...	...	674
Royalty, at 2 annas per maund	...	...	...	...	2,062
			Total	...	4,583
Sale of 1,650,000 lbs. fuel, @ 360 lbs. per rupee		...	...	...	4,583

The Cantonment royalty might be obtained by one of the fowllowing means :—

(1) Departmentally, the fuel supply being placed under the European Forest Ranger, a system which, if well supervised, would undoubtedly be the most profitable.

(2) By farming the supply, taking the highest amount obtainable by auction or tender.

(3) By contract, the contractor being bound to draw his supply from the forests, say, during a period of four months, during which time a special establishment would be necessary to superintend the weighing into depôt, and on whose weighments the royalty fixed would be paid.

APPENDIX D

LIST OF REGISTERS, WITH FORMS AND NOTES ON MAINTENANCE OF SAME.

FORM 1.—*Classification of Revenue and Expenditure.*

1. All revenue and expenditure will be classified in accordance with the arrangement of Form No. 1. The heads of expenditure are separated under the two main heads " A—Conservancy and Works," and " B—Establishments."

2. The sub-heads under Revenue head I are intended to show, as far as practicable, the income under (*a*) timber, (*b*) fuel, (*c*) grazing and grass. The charges incurred on account of timber and other produce removed from the forests cannot very well be shown separately, and so there are no sub-heads corresponding to the revenue sub-heads, but only one main head for all.

3. Head II will include all revenue that cannot properly be classified under the other sub-heads.

4. Heads II and III, under " A.—Conservancy and Works" have no corresponding heads under receipts.

5. Head A. III.—Works of Improvement.

6. Under sub-head III (*a*) will come all charges connected with the formation and maintenance of boundary lines and pillars. Sub-head III (*b*) refers to all sowing and planting operations, whether they are undertaken for the purpose of forming plantations or of assisting natural reproduction.

Sub-head III (*c*) will show the cost of fire protection ; such extra temporary establishment as is sanctioned for this purpose, as well as the cost of fire lines or the suppression and extinction of fires which have broken out, should be charged.

The sub-head III (*d*) is only intended to show expenditure on account of permanent roads and buildings. Temporary roads and structures should be charged under timber expenses.

7. Sub-head III (*e*) Miscellaneous. Against this sub-head all charges not chargeable to a special sub-head will be charged.

8. The " B.—Establishment " heads call for no explanations.

FORM No. 2.—(*Cash-book*).

1. The accounts will be kept in a bound cash-book (Form No. 2), in which all money transactions will be entered as they occur. All items of revenue and expenditure will be classfied in accordance with the heads and sub-heads as shown in Form No. 1. Sufficient detail will be given in the column of " Particulars" to admit of the main points of each transaction being readily ascertained without reference to the detailed vouchers. The cash-book will be closed monthly.

2. All accounts must be kept in the most regular and open manner. All receipts, disbursements, and charges of whatever sort must be clearly shown in the cash-book.

FORM No. 3.

Summary of Revenue and Expenditure.

1. This summary will be compiled at the close of the year from the cash-book. If it is considered desirable to keep a monthly summary, the same form will answer. The monthly summary would facilitate the compilation of the annual one.

FORM No. 4.

Monthly Register of Yield.

1. The yield will be shown in this form, compartment by compartment. The form will be compiled at the close of the month from the cash-book. If any portion of the yield (fuel) shown in column 11 was the produce of the fellings entered in columns 6 and 8, a note showing the quantity should be given in column 14 ; see example (*a*) in the Form. This will obviate the same yield being shown twice over.

2. An annual form in the same form as the monthly one should be kept up. It will be compiled from the monthly forms. In the case of fellings made being below the quantity permitted to be removed under the working plan, the balance will be available for removal in the following year, in addition to the regular provision for that year. Should the fellings have exceeded the provisions of the working plan, the authority under which such excess has been permitted should be stated in the note. Such excess will be deducted from the fellings of future years.

FORM No. 5.

Statement of forest areas protected from fire during the year.

1. In this form will be kept up a record of the fire conservancy operations provided for in the working plan. The area to be brought forward in column 4 is the area shown under the sub-column " actually protected" of column 5.

2. The annual results of fire conservancy should be shown in a special copy of the Cantonment map, *i.e.*, the area to be protected should be shown by a blue wash line and the year in which conservancy commenced be entered. Any areas subsequently added will be entered and the year noted. To show the portions burnt annually thin red wash lines should be drawn round the areas burnt and the year when they were burnt should also be entered.

FORM No. 6.

Forest and Plantation Journal.

A forest and plantation journal should be kept up as follows:—Planting, new paths, new orders, fires and any occurrences of note affecting the forest will be recorded.

FORM No. 1.

Classification of Revenue and Expenditure.

Revenue.	Expenditure.	
	A.—Conservancy and Works.	*B.—Establishment.*
I. Timber and other produce removed from the forests— *a.* Timber. *b.* Fuel. *c.* Grazing and grass. II. Miscellaneous receipts.	I. Timber and other produce removed from the forests. II. Stores, tools and plant. III. Works of Improvement— *a.* Demarcation. *b.* Sowing and planting. *c.* Protection from fire. *d.* Roads or buildings. *e.* Miscellaneous other charges.	I. Salaries of Forest Establishment. II. Contingencies, Stationery and Sundries.

FORM No. 2.

Cash-Book of *in charge of the Ránikhet Cantonment Forests, for the month of* 188

Date.	No. of item.	Particulars.	*Receipts.* Cash or Treasury.			Head of service.	Date.	No. of voucher.	Particulars.	*Disbursements.* Cash or Treasury.			Head of service.
			Rs.	a.	p.					Rs.	a.	p.	

Dated the 188 (Sd.)

FORM No. 3.

Summary of Revenue and Expenditure for the year 188 .

Heads, Revenue.	Total Revenue of the year.			Heads, Expenditure A.—Conservancy and Works.	Total A—Expenditure of the year.			Heads, Expenditure, B.—Establishment.	Total B.—Expenditure of the year.		
	Rs.	a.	p.		Rs.	a.	p.		Rs.	a.	p.
I. Timber and other produce removed from the forests— *a* Timber ... *b.* Fuel ... *c.* Grazing and grass. II. Miscellaneous receipts ...				1. Timber and other produce removed from the forests II. Store, tools and plant ... III. Works of Improvement— *a.* Demarcation ... *b.* Sowing and planting .. *c.* Protection from fire ... *d.* Roads or buildings ... *e.* Miscellaneous other charges...				I. Salaries of Forest Establishment ... II. Contingencies, Stationery and Sundries ... Total B. ... Add A. ...			
Total, Revenue ...				Total A. ...				GRAND TOTAL ...			

TABLE OF EQUIVALENTS.

SOLID.

Chír, 100 maunds of 100 lbs., per maund	=	217·39 cubic feet.
Oak, 100 maunds of 100 lbs., per maund	=	166 66 „
Miscellaneous, 100 maunds of 100 lbs., per maund	=	217·39 „

STACKED.

Chír, 100 maunds	=	326·08 cubic feet.
Oak, 100 maunds	=	250 „
Miscellaneous, 100 maunds	=	326·08 „

FORM No. 4.

Monthly Register of yield for the month of 188

Group and compartment.	Provisions of working plan.		Result of operations.										Remarks.
	Description of operations.	Area to be worked.	Area taken in hand.	*Selection fellings, i.e., of mature trees.*		*Thinnings.*		*Total of columns 5 to 8.*		*Fuel.*	*Grass.*	*Minor produce.*	
				Number.	Cubic feet.	Number.	Cubic feet.	Number.	Cubic feet.	Cubic feet.	Maunds.	Value.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
										(a) Pine 1,000	. .	...	(a) 500 cubic feet from selection fellings, balance from dead fallen timber.

FORM No. 5.

Statement of Forest areas protected from fire during the year 188

1	2	3	4	5			6	7
				During 188 .				
Forests.	Compartments.	Year in which protection commenced.	Area actually protected up to	Area attempted to be protected.	Failures.	Actually protected	Cost during the year.	Remarks.
			Acres.	Acres.	Acres.	Acres.	Rs a. p	For the purposes of this form the year will be taken as from 1st July to the 30th June following.
	Total ...							

DATED
The 188 . } (Sd)

FORM No. 6.

Ránikhet Cantonment Forest and Plantation Journal.

Year	Month	Particulars.
1887 ...	July ...	Planting up blanks in Compartment 5 was commenced, 5,000 deodár were planted out in pits 3′ × 3′ × 3′ among the undergrowth of oak. The plants 18 months old were obtained from the forest nursery Chaubattia. The pits were somewhat irregularly placed, but as far as possible in lines 20 feet apart and 10 feet apart in the lines. The area planted is shown on the map and the year of planting entered; failures in 1886 planting in compartment 3 were made good, 300 seedlings deodar and 200 kail being planted out.

No. $\frac{309F.}{493-34}$ OF 1888.

RESOLUTION.

REVENUE (FOREST) DEPARTMENT.

Dated Naini Tál, the 6th June, 1888.

READ the undermentioned papers :—

(1) Working plan of the Ránikhet Cantonment Forests.

(2) Letter from the Quartermaster-General in India, No. 2643B., dated 7th June, 1887.

(3) Letter from the Officiating Inspector-General of Forests, to the Government of India, No. 759, dated 14th October, 1887, and enclosures.

(4) Letter from the Officiating Inspector-General of Forests, to the Government of India, No. 109, dated 24th February, 1888, and enclosures.

(5) Letter from the Officiating Inspector-General of Forests, to the Government of India, No. 334, dated 14th May, 1888, and enclosures.

RESOLUTION.—The Lieutenant-Governor and Chief Commissioner is pleased to sanction the Working Plan of the Ránikhet Cantonment Forests.

By order, &c.,

J. WOODBURN,

Chief Secy. to Govt., N.-W. P. and Oudh.

No. $\frac{310F.}{493-35}$.

COPY forwarded to the Inspector-General of Forests to the Government of India, for information.

No. $\frac{311F.}{493-36}$.

COPY also forwarded to the Conservator of Forests, Central Circle, for information and guidance, with the request that 100 copies of the plan be printed, and that 50. copies be forwarded to this office for distribution to the Government of India and other Local Governments and Administrations, the remaining copies being distributed by the Conservator himself to other Conservators, as directed in Circular No. 3F. of 1886, from the Government of India in the Home (Forests) Department.

No. $\frac{312F.}{493-37}$.

COPY also forwarded to the Commissioner, Kumaun Division, for information.

No. $\frac{313F.}{493-38}$.

COPY also forwarded to the Quartermaster-General in India, for information.

By order, &c.,

W. H. L. IMPEY,

Under-Secy. to Govt., N.-W. P. and Oudh.